5.2 RESPIRATION

Glycolysis

- First stage of both aerobic and anaerobic respiration
- Occurs in the cytoplasm
- Glucose is phosphorylated
  - Requires ATP to supply phosphate groups and energy
  - Phosphorylated glucose splits into 2 triose phosphate molecules
- A 6-carbon sugar is split into 2 pyruvate molecules (3-carbon molecules)
- Triose phosphate is oxidised
  - NAD is reduced
  - NAD is re-oxidised so it can continue to be used in glycolysis
- Produces 2 pyruvate molecules
- Products of glycolysis are 2 pyruvate, 2 ATP and 2 reduced NAD
- 2 molecules of ATP are formed per pyruvate molecule
- Net gain of 2 ATP molecules per glucose

Aerobic respiration

- Pyruvate is actively transported in mitochondrial matrix
- Link reaction
  - Pyruvate is oxidised to acetate
  - Acetate + CoA = acetyl CoA
  - Reduced NAD and CO2 are produced
- Acetyl CoA combines with 4-carbon molecule to make 6-carbon molecule
- Krebs cycle
  - Substrate-level phosphorylation produces ATP
  - CO2 lost
  - Generates reduced coenzymes NAD and FAD
  - Oxidation and reduction reactions
- Oxidative phosphorylation
  - Electrons from NAD and FAD
  - Electron transfer chain
    - Electrons provide energy for proton active transport
    - Movement of protons through ATP synthase
    - Chemiosmotic theory

Anaerobic respiration

- Occurs in absence of oxygen
- Produces only 2 ATP molecules per glucose (during glycolysis)
- Produces ethanol and carbon dioxide in plants and fungi
- Produces lactate in animals
  - Lactate can be converted back to pyruvate when oxygen is present
  - Lactate causes cramp and muscle fatigue

AQA

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